



Department of Energy

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MAR 02 1994

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Incoming: 9400852

94-RPS-150

Mr. A. W. Conklin, Head  
Air Emissions and Defense  
Waste Section  
State of Washington  
Department of Health  
Airdustrial Park Building 5, LE-13  
Olympia, Washington 98504-0095

Dear Mr. Conklin:

NOTICE OF CONSTRUCTION APPLICATION PURSUANT TO WASHINGTON ADMINISTRATIVE  
CODE 246-247 FOR VENTILATION UPGRADES, 241-AY AND 241-AZ TANK FARMS

Enclosed please find a Notice of Construction (NOC) for Ventilation  
Upgrades, 241-AY and 241-AZ Tank Farms. This NOC is being submitted  
pursuant to Washington Administrative Code 246-247.

The NOC includes two projects: Project W-151 and Project W-030.  
Project W-151, 101-AZ Retrieval System, will add two 300 horsepower mixer  
pumps to Tank 241-AZ-101, to demonstrate retrieval methods. Project W-030,  
Tank Farm Ventilation Upgrade, will modify the existing ventilation system  
currently in use in the 241-AY and 241-AZ Tank Farms. The combined effect of  
these projects will result in decreased emissions from these tank farms. The  
unabated emissions from these two projects, with operations otherwise normal,  
results in an offsite dose of 550 millirem per year. The emissions from  
routine operations, with abatement equipment in use, result in a maximum  
offsite dose of .001 mrem per year.

Should you have any questions, please contact me or Mr. S. D. Stites of my  
staff on (509) 376-8566.

Sincerely,

*James D. Bauer*

James D. Bauer, Program Manager  
Office of Environmental Assurance,  
Permits, and Policy

EAP:SDS

Enclosure:  
RAEP NOC, Ventilation Upgrades

cc w/encl:  
Administrative Records  
J. Kalia, WHC  
J. Luke, WHC



Enclosure

100-92816  
943275-000

**RADIOACTIVE AIR EMISSIONS PROGRAM  
NOTICE OF CONSTRUCTION,  
VENTILATION UPGRADES, 241-AY AND 241-AZ TANK FARMS**

## **1.0 Facility Information**

Tank Farms 241-AY and 241-AZ are located at adjacent sites in the 200 East Area of the Hanford Site. Each tank farm contains two tanks and a single system ventilates all four tanks. Two projects that have the potential to alter air emissions from these farms are currently in the design phase. Project W-151, 101-AZ Retrieval System, will add two 300 horsepower mixer pumps to Tank 241-AZ-101, to demonstrate retrieval methods. Project W-030, Tank Farm Ventilation Upgrade, will modify the existing ventilation system currently in use in these tank farms.

The modifications proposed under Project W-030 will NOT result in an increase in air emissions, and the project would be proposed even if Project W-151 were not proposed. However, because of the increased ventilation requirements due to Project W-151, Project W-030 is being designed to meet the additional requirements. Due to the additional heat load of the mixer pumps, and the agitation of the waste by the pumps, emissions will potentially increase due to Project W-151. When both projects are complete, the potential dose to the public will be less than from the existing system.

## **2.0 Source Information**

### **2.1 Listing of Source**

Currently, Stack 296-A-17, a stack included in the FF-01 Permit for the Hanford Site, is the exhaust for the ventilation system at the 241-AY and 241-AZ Tank Farms. This stack will be replaced, the existing stack will be removed from service, the registration of the existing stack will be withdrawn, and a new registration form will be submitted. The change in registration will occur prior to the operation of the new system. The existing stack and ventilation system will be removed by a future project.

### **2.2 DESCRIPTION OF THE SOURCE**

#### **2.2.1 System Function/Area Exhausted**

The vapor space of the four tanks in the affected tank farms will be exhausted with the new system, however only a portion of the exhaust withdrawn from the tank will be emitted to the atmosphere. Please refer to the following section for a description of the operation of the new ventilation system.

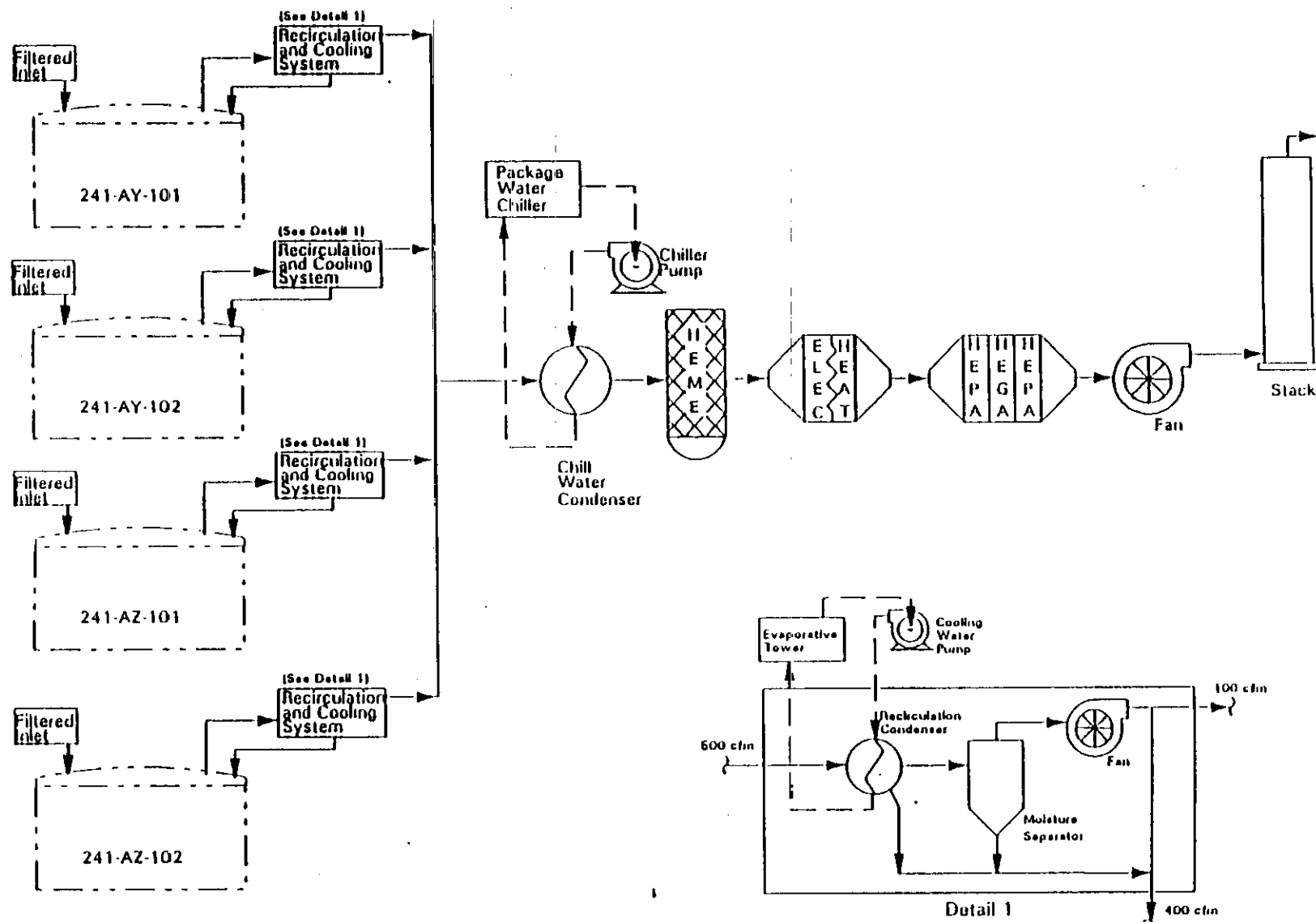
### 2.2.2 Effluent System Layout

Project W-030 will install two systems that will affect emissions: a recirculating coolant system and a ventilation system. The recirculating coolant system is considered a portion of the process and not a part of the emission control system. Each tank will have a separate recirculating coolant system, as shown in Figure 1, which will consist of a recirculation condenser and a moisture separator and will operate at approximately 500 standard cubic feet per minute (scfm). Approximately 100 scfm will be split from this stream, prior to recirculation to the tanks, and combined with 100 scfm from each of the other tanks. The combined 400 scfm will be discharged to the atmosphere. When the mixer pumps are operated, the 500 scfm being drawn from 241-AZ-101 will not be recirculated. It will be combined with the 100 scfm from each of the other three tanks for a total discharge of 800 scfm. The remaining flow from the other three tanks will continue to be recirculated back to the tanks.

The portion of the stream that is to be discharged to the atmosphere (400 scfm or 800 scfm) will flow through an emissions control system consisting of a condenser, high efficiency mist eliminator (HEME), heater, and two high efficiency particulate air (HEPA) filters with a high efficiency gas adsorption unit between the HEPAs (Figure 1). Unabated emissions are the emissions prior to this emission control system. A discussion of the control technology selection is included in Appendix A.

The existing ventilation system consists of a condenser, moisture deentrainer, and two HEPA filters. Project W-030 will add the recirculating coolant system and the high efficiency gas adsorption unit which will result in decreased emissions from the 241-AY and 241-AZ Tank Farms.

Figure 1: System Layout



### 2.2.3 Efficiency Values of Each Control Device for Removal of Radioactivity

The efficiency of each piece of control equipment is included in Table 1.

Table 1: Control Equipment Effectiveness

Equipment	Decontamination Factor	Removal Efficiency	Contaminate
Condenser	5	80 percent	Soluble particulates
	3	66.7 percent	Insoluble particulates
	2	50 percent	Tritiated water
HEME	15	93.3 percent	Soluble and insoluble particulates
	4	75 percent	Tritiated water
gas adsorber (HEGA)	50	98 percent	Radioactive Iodine vapor
	2	50 percent	Other radioactive gases
HEPA filters (2)	3,000,000	99.99997 percent	Particulates

### 2.2.4 Means and Frequency of Testing and Inspecting Effluent Treatment System

The testing and inspection of the treatment system will be done in accordance with protocols established for the Hanford Site. At a minimum, the efficiency of the HEPA filters will be tested annually, to verify particulate removal efficiency. The HEME and high efficiency gas adsorption units will also be inspected at least every year as a part of the established preventive maintenance program in Tank Farms.

### 2.2.5 Operating Mode (Continuous or Batch)

The ventilation system will be operated 24 hours a day, 365 days a year. During fiscal year 1997, the mixer pumps in Tank 241-AZ-101 will operate 800 mixer pump hours (one hour with one mixer operating) to determine the effectiveness of the mixer pumps for waste retrieval purposes and an additional 336 mixer pump hours over one week for the first wash. During fiscal year 1998, 336 mixer pump hours over one week will be required for the second wash. For retrieval (currently scheduled for fiscal year 1999), 636 mixer pump hours will be required over two weeks. These durations and estimated dates of occurrence are approximate.

## 2.2.6 Chemical and Physical Forms of the Releases

Radionuclide emissions will be in both particulate and gaseous forms. ~~Tritium is in the form of water vapor.~~ Iodine, Ruthenium, Rhodium, Tin, and Antimony are in gaseous forms. All other radionuclides are assumed to be in particulate forms.

## 2.2.7 Stack Data

The stack will be 55 feet high with a 24 inch diameter duct for the bottom 47 feet of the stack, ten inch diameter duct for the remaining eight feet, to increase the exit velocity. The average stack temperatures will be approximately 50° F and the exhaust rate will be approximately 400 scfm when the mixer pumps are not in operation, and 800 scfm when they are operated. Unit dose conversion tables were used in the preparation of this application (WHC 1991). Information previously provided to the State of Washington Department of Health (DOH) provides the data used to model the source (e.g., Chi/Q and wind rose data). Information on the releases from the exhaust system are included in Section 4.2.

## 2.3 Description of the Effluent Sampling/Monitoring System

The stack will be equipped with sampling equipment designed and operated in accordance with 40 Code of Federal Regulations (CFR) 61, Subpart H, and all referenced requirements. Among other design criteria, sample probes will be designed to obtain representative samples, the location will be selected in accordance with referenced standards, and sample line length and bends will be minimized. The sampler for particulates, iodine, and tritium will operate continuously and will be calibrated and audited in accordance with procedures currently used in tank farms. Additionally, for operational purposes, the stack will contain a monitor for beta and gamma radiation.

## 3.0 General Information on Sample Analysis

The stack sample media will be analyzed in accordance with existing procedures previously supplied to the DOH during audits.

## 4.0 Demonstration of Compliance

### 4.1 Methodology Used to Demonstrate Compliance

Unit dose factors developed to support Facility Effluent Monitoring Plans were used to demonstrate compliance with Washington Administrative Code (WAC) 246-247 and WAC 173-480. The factors are based on the computer model CAP-88, which is approved by the U.S. Environmental Protection Agency to calculate the effective dose equivalent to the maximally exposed individual (MEI). The MEI is located 16 km (10 mi) east of the 200 East Area of the Hanford Site.

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## 4.2 INPUT DATA USED-SOURCE TERM

A source term was developed based on existing knowledge of the tank vapor space contents, accounting for emissions both with and without the operation of the mixer pumps in Tank 241-AZ-101. This information is included as Appendix A of the Supplemental Design Requirements Document for Project W-030 (WHC 1992), and repeated in Table 2. Based on this information, annual unabated emissions have been estimated both with and without the mixer pumps operational in Tank 241-AZ-101. The ventilation rate is 400 scfm when the mixer pumps are not in operation, and 800 scfm when they are operated.

Table 2: Unabated Emissions

Radionuclide	Without Mixer Pumps Running		With Mixer Pumps Running	
	$\mu\text{Ci}/\text{ft}^3$	Ci/yr	$\mu\text{Ci}/\text{ft}^3$	Ci/yr
H-3	7.0E-01	1.5E+02	8.8E-01	3.7E+02
Sr-90	5.6E+01	1.2E+04	2.8E+01	1.2E+04
Y-90	5.6E+01	1.2E+04	2.8E+01	1.2E+04
Ru-106	6.9E-08	1.4E-05	3.5E-08	1.5E-05
Rh-106	6.9E-08	1.4E-05	3.5E-08	1.4E-05
Sn-113	1.3E-07	2.6E-05	6.3E-08	2.6E-05
Sb-125	6.2E-07	1.3E-04	3.1E-07	1.3E-04
I-129	3.9E-05	8.4E-03	1.9E-05	8.0E-03
Cs-137	1.9E+00	3.9E+02	9.5E-01	3.9E+02
Ba-137m	1.8E+00	3.7E+02	9.4E-01	3.7E+02
Pu-239	2.7E-03	5.6E-01	1.4E-03	5.9E-01
Pu-240	2.7E-03	5.4E-01	1.4E-03	6.0E-01

## 4.3 RESULTS OF THE METHOD

Based on the efficiencies and decontamination factors shown in Table 1, controlled emissions can be determined both with and without the mixer pumps operational, and are shown in Tables 3 and 4, respectively.

Table 3: Abated Emissions Without Mixer Pumps Running

Radionuclide	Unabated	After Condenser	After HEME	Abated Emissions	
	Ci/min	Ci/min	Ci/min	Ci/min	Ci/yr
H-3	2.8E-04	7.0E-05	3.4E-05	3.4E-05	1.8E+01
Sr-90	2.3E-02	7.6E-03	5.0E-04	1.7E-10	8.9E-05
Y-90	2.2E-02	7.4E-03	4.9E-04	1.7E-10	8.7E-05
Ru-106	2.7E-11	2.7E-11	2.7E-11	1.4E-11	7.3E-06
Rh-106	2.7E-11	2.7E-11	2.7E-11	1.5E-11	7.2E-06
Sn-113	5.0E-11	5.0E-11	5.0E-11	2.6E-11	1.4E-05
Sb-125	2.5E-10	2.5E-10	2.5E-10	1.2E-10	6.4E-05
I-129	1.6E-08	1.6E-08	1.6E-08	3.2E-10	1.6E-04
Cs-137	7.5E-04	1.5E-04	1.0E-05	3.4E-12	1.8E-06
Ba-137m	7.1E-04	1.4E-04	9.5E-06	3.2E-12	1.7E-06
Pu-239	1.1E-06	3.7E-07	2.4E-08	7.9E-15	4.1E-09
Pu-240	1.0E-06	3.6E-07	2.4E-08	7.9E-15	4.2E-09

Table 4: Abated Emissions With Mixer Pumps Running

Radionuclide	Unabated	After Condenser	After HEME	Abated Emissions	
	Ci/min	Ci/min	Ci/min	Ci/min	Ci/yr
H-3	7.0E-04	1.8E-04	8.3E-05	8.3E-05	4.4E+01
Sr-90	2.3E-02	7.6E-03	5.0E-04	1.7E-10	8.9E-05
Y-90	2.2E-02	7.4E-03	4.9E-04	1.7E-10	8.7E-05
Ru-106	2.9E-11	2.9E-11	2.9E-11	1.4E-11	7.4E-06
Rh-106	2.7E-11	2.7E-11	2.7E-11	1.4E-11	7.3E-06
Sn-113	5.0E-11	5.0E-11	5.0E-11	2.5E-11	1.3E-05
Sb-125	2.5E-10	2.5E-10	2.5E-10	1.2E-10	6.4E-05
I-129	1.5E-08	1.5E-08	1.5E-08	3.1E-10	1.6E-04
Cs-137	7.5E-04	1.5E-04	1.0E-05	3.4E-12	1.8E-06
Ba-137m	7.1E-04	1.4E-04	7.3E-06	3.2E-12	1.7E-06
Pu-239	1.1E-06	3.7E-07	2.5E-08	8.2E-15	4.3E-09
Pu-240	1.1E-06	3.7E-07	2.5E-08	8.2E-15	4.3E-09

Table 5 contains the dose to the maximally exposed offsite individual from the emissions included in Tables 3 and 4. The unit dose factors were previously developed and provided to the regulatory agency (WHC 1991).

Table 5: Abated Emissions and Dose

Radionuclide	Unit Dose Factor	Without Mixer Pumps Running		With Mixer Pumps Running	
	mrem/Ci	Ci/yr	mrem/yr	Ci/yr	mrem/yr
H-3	2.2E-05	1.8E+01	3.9E-04	4.4E+01	9.6E-04
Sr-90	4.4E-02	8.9E-05	3.9E-06	8.9E-05	3.9E-06
Y-90	3.8E-04	8.7E-05	3.3E-08	8.7E-05	3.3E-08
Ru-106 <sup>1</sup>	2.1E-02	7.3E-06	1.5E-07	7.4E-06	1.6E-07
Rh-106		7.2E-06		7.3E-06	
Sn-113	1.2E-03	1.4E-05	1.6E-08	1.3E-05	1.6E-08
Sb-125	4.2E-03	6.4E-05	2.6E-07	6.4E-05	2.6E-07
I-129	2.9E-01	1.6E-04	4.7E-05	1.6E-04	4.7E-05
Cs-137 <sup>1</sup>	2.4E-02	1.8E-06	4.2E-08	1.8E-06	4.2E-08
Ba-137m		1.7E-06		1.7E-06	
Pu-239	8.7E+00	4.1E-09	3.6E-08	4.3E-09	3.7E-08
Pu-240	8.7E+00	4.2E-09	3.6E-08	4.3E-09	3.7E-08
Total Dose			4.4E-04		1.0E-03

Note 1: Dose includes daughter product

The operation of the mixer pumps more than doubles the emissions, however total emissions are still well below the ten mrem/year Standard. As shown, the majority of the increased dose is due to tritium. The dose resulting from all Hanford Site operations in 1992, was calculated at 0.004 mrem/yr (PNL 1993) for an individual located at Ringold. The MEI for the 200 East Area is located 16 km East of 200 East. For 1992 emissions from the existing ventilation system, emissions resulted in a dose of 0.0015 mrem/yr to the individual located 16 km East of 200 East. The emissions as a result of a full years operation of the mixer pump in Tank 241-AZ-101, in conjunction with previous operations at the Hanford Site, will not result in a violation of the National Emission Standard of ten mrem/yr (40 CFR 61).

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## 5.0 References

PNL 1993, *Hanford Site Environmental Report for Calendar Year 1992*, PNL 8682, Pacific Northwest Laboratory, Richland, Washington.

WHC, 1991, *Unit Dose Calculation Methods and Summary of Facility Effluent Monitoring Plan Determinations*, WHC-EP-0498, Westinghouse Hanford Company, Richland, Washington.

WHC, 1992, *Supplemental Definition of Requirements, Project W-030, Tank Farm Ventilation Upgrades*, WHC-SD-W030-RD-001, Westinghouse Hanford Company, Richland, Washington.

40 CFR 61, "National Emission Standards for Hazardous Air Pollutants (NESHAP)" *Code of Federal Regulations*, as amended.

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APPENDIX A  
DISCUSSION OF BEST AVAILABLE RADIONUCLIDE CONTROL TECHNOLOGY

A.1 INTRODUCTION

Projects W-030, Tank Farm Ventilation Upgrade, and W-151, 101-AZ Retrieval System are included in this discussion of best available radionuclide control technology (BARCT). Project W-030 is upgrading the ventilation system at the AY/AZ Tank Farms, and Project W-151 is adding mixer pumps to Tank 241-AZ-101. The mixer pumps will increase vaporization from the waste solution, which will increase the flow from the tanks. The system has been designed to decrease the level of emissions, including the increased air flow from the pumps, to a level below the current emission rate without the pumps. For a description of the projects, please refer to the Notice of Construction (NOC) to which this BARCT discussion is appended. For this discussion, the recirculation loop shown in Figure 1 is considered to be a part of the process, not a part of the emission control system, although the addition of the recirculation loop provides an added effect of lowering emissions to the ventilation system.

A.2 UNABATED EMISSIONS

The unabated emissions, both with and without the mixer pumps operating in Tank 241-AZ-102 are included in Table A.1. Also included in Table A.1 is the unabated dose, as well as the percent of the unabated dose contributed by each radionuclide. Where no dose is listed for a radionuclide, the dose was included with the parent radionuclide. The unit dose factors previously developed and provided to the regulatory agency were used to determine the unabated dose in Table A.1.

Strontium-90 contributes over 96 percent of the unabated dose, and another 2 percent of the unabated dose is due to Cs-137. Both of these radionuclides are in particulate form in this ventilation system. Because particulates contribute over 90 percent of the unabated dose, only particulate control equipment will be discussed in the following section.

Table A.1 Unabated Emissions

Radionuclide	Without Mixer Pumps Running			With Mixer Pumps Running		
	Ci/yr	mrem/yr	percent of unabated dose	Ci/yr	mrem/yr	percent of unabated dose
H-3	1.5E+02	3.2E-03	5.9E-04	3.7E+02	8.1E-03	1.5E-03
Sr-90	1.2E+04	5.2E+02	9.6E+01	1.2E+04	5.2E+02	9.6E+01
Y-90	1.2E+04	4.4E+00	8.1E-01	1.2E+04	4.4E+00	8.1E-01
Ru-106	1.4E-05	3.0E-07	5.5E-08	1.5E-05	3.2E-07	5.8E-08
Rh-106	1.4E-05		0.0E+00	1.4E-05		0.0E+00
Sn-113	2.6E-05	3.1E-08	5.7E-09	2.6E-05	3.1E-08	5.7E-09
Sb-125	1.3E-04	5.4E-07	9.9E-08	1.3E-04	5.4E-07	9.9E-08
I-129	8.4E-03	2.5E-03	4.5E-04	8.0E-03	2.3E-03	4.3E-04
Cs-137	3.9E+02	9.4E+00	1.7E+00	3.9E+02	9.4E+00	1.7E+00
Ba-137m	3.7E+02		0.0E+00	3.7E+02		0.0E+00
Pu-239	5.6E-01	4.9E+00	8.9E-01	5.9E-01	5.1E+00	9.4E-01
Pu-240	5.4E-01	4.7E+00	8.6E-01	6.0E-01	5.2E+00	9.4E-01
		5.5E+02	1.0E+02		5.5E+02	1.0E+02

### A.3 Discussion of Control Technologies

For applications of this type, high efficiency metal filters (HEMF) and HEPA filters have the greatest removal efficiency for small particles. HEMFs have an efficiency of 99.99 percent, while HEPA filters have an efficiency of 99.97 percent. The HEMFs are generally installed with washing capabilities, which increases the capital cost of the control equipment over HEPA filters. However HEPA filters must be disposed of as solid waste when they become loaded with particulates, whereas HEMFs can be washed in place a number of times prior to disposal.

An exhaustive discussion of economic, energy, and environmental impacts is not included in this BARCT discussion, because the U.S. Department of Energy (DOE) rules require that ventilation systems of this type be installed with two HEPA filters in series. Although it is anticipated that HEMFs will soon be approved for use by DOE, the approval is not expected prior to the start of construction of this project. A HEMF could be added to the HEPA filters, increasing the efficiency of the overall system, however the additional cost is not justified by the increase in control efficiency. Additionally, the wash water from the HEMFs must be handled as a mixed waste

and returned to the tanks. This increases the volume of waste to be stored in the tanks and disposed of when a final disposal option is implemented.

Section 2.2.3 of the NOC includes a table of all control equipment included in this exhaust system. Iodine, Ruthenium, Rhodium, Tin, Antimony, and Tritium contribute a small portion of the unabated dose, other components of the exhaust system will mitigate the release of these radionuclides.

#### A.4 Abated Emissions

Based on the overall efficiency of the ventilation system to mitigate releases of radionuclides to the atmosphere, Table A.2 shows the abated emissions and the resulting dose from the operation of the new ventilation system, with and without the mixer pumps operating.

Table A.2 Abated Emissions and Dose

Radionuclide	Without Mixer Pumps Running		With Mixer Pumps Running	
	Ci/yr	mrem/yr	Ci/yr	mrem/yr
H-3	1.8E+01	3.9E-04	4.4E+01	9.6E-04
Sr-90	8.9E-05	3.9E-06	8.9E-05	3.9E-06
Y-90	8.7E-05	3.3E-08	8.7E-05	3.3E-08
Ru-106 <sup>1</sup>	7.3E-06	1.5E-07	7.4E-06	1.6E-07
Rh-106	7.2E-06		7.3E-06	
Sn-113	1.4E-05	1.6E-08	1.3E-05	1.6E-08
Sb-125	6.4E-05	2.6E-07	6.4E-05	2.6E-07
I-129	1.6E-04	4.7E-05	1.6E-04	4.7E-05
Cs-137 <sup>1</sup>	1.8E-06	4.2E-08	1.8E-06	4.2E-08
Ba-137m	1.7E-06		1.7E-06	
Pu-239	4.1E-09	3.6E-08	4.3E-09	3.7E-08
Pu-240	4.2E-09	3.6E-08	4.3E-09	3.7E-08
Total Dose		4.4E-04		1.0E-03

Note 1: Dose includes daughter product

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## CORRESPONDENCE DISTRIBUTION COVERSHEET

Author

Addressee

Correspondence No.

J. D. Bauer, RL  
(C. E. Sowa, WHC)

A. W. Conklin, DOH

Incoming:9400852  
XRef:9451047D

Subject: NOTICE OF CONSTRUCTION APPLICATION PURSUANT TO WASHINGTON  
ADMINISTRATIVE CODE 246-247 FOR VENTILATION UPGRADES, 241-AY AND  
241-AZ TANK FARMS

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